CPCCo Central Plateau Cleanup Company

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Administrative Procedure

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Industrial Hygiene Exposure Assessments

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- 324 Facility :
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  Screener: Kraemer, Laurie
- PFP Ancillary Structures :
  Categorical Exclusion: GCX-2 (Editorial Changes)
  Screener: Kraemer, Laurie

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Change Summary

Description of Change

Editorial change consists of updating company terminology (CHPRC to CPCCo) and referenced documents (PRC to CPCC), as well as an update to the current procedure templates, including spell check and updated table of contents.

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1.0 INTRODUCTION

1.1 Purpose

This procedure provides a process for conducting and documenting Industrial Hygiene Exposure Assessments (IHEA) to support Central Plateau Cleanup Company (CPCCo)-directed work activities. This procedure also provides guidance for the processes of hazard evaluation and identification of controls.

Industrial Hygiene Exposure Assessment (IHEA) documentation, with hazard evaluation and control considerations, provides the framework to support safe work, as described in CPCC-PRO-WKM-12115, *Work Management*, and is a tool for the Industrial Hygienist (IH) to consistently characterize, document, and control exposure to occupational health hazards, including carcinogens.

1.2 Scope

The IHEA process identifies and evaluates anticipated biological, chemical, ergonomic, and physical agent hazards potentially present in products, materials, equipment and legacy wastes associated with CPCCo-directed work activities. IHEA is the process used to develop and assess control measures, and to maintain occupational exposures as low as practicable.

This procedure does not address the following exposure hazards:

- Radiological hazards covered under 10 CFR 830, *Nuclear Safety Management*
- Bloodborne pathogens covered under 29 CFR 1910.1030, *Bloodborne Pathogens*
- Facility/process exposure hazards and controls addressed through design engineering

1.3 Applicability

This procedure is applicable when conducting and documenting IHEAs to support CPCCo work activities.

1.4 Implementation

This procedure is effective on the date published. Existing IHEAs and their supported documents (including previous form versions) in the process of being revised, may continue the revision up to 30 days after publication. Existing IHEAs and their supported documents not in revision process, must be revised to meet the requirements of this procedure during their next scheduled review, including the use of current versions of all forms.

2.0 RESPONSIBILITIES

Responsibilities associated with this procedure are identified in the process steps.

3.0 PROCESS

IHEA is a process for documenting the identification and evaluation of potential exposure hazards from biological, chemical, ergonomic and physical agents for a defined scope of work. Under the IHEA process, a negative exposure determination is as important to discuss and document, as exposure to hazards of occupational significance.

If an agent is evaluated and found to pose a potential hazard of occupational significance, then a documented evaluation is required. If the work scope is determined not to include hazards of occupational significance, then a documented evaluation is not required (although not required, this determination can be documented on an Industrial Hygiene [IH] Hazard Screening Form).

IHEAs are managed with version controls. When a work scope change introduces new hazards, or previously unidentified hazards are discovered during work performance, the IHEA is revised (the same would apply when a hazard is removed from the scope or found not to exist).

Hazards of occupational significance include, but are not limited to:

- Exposure above an Administrative Control Level (ACL), typically set to 10% of the Occupational Exposure Limit (OEL) for chemicals;
- Significant exposure from skin absorption (e.g. TLV with a “Skin” Notation);
- Skin/eye damage due to contact can occur;
- The agent is a skin or respiratory sensitizer (e.g., TLV with a “DSEN” or “RSEN” Notation);
- The agent is a carcinogen (see Appendix C);
- The agent poses a clearly-recognized potential exposure hazard, such as Hantavirus, or
- The agent adversely affects reproductive health.

IHEA documentation requirements are considered “met” using the following agent-specific hazard evaluations, as conducted in accordance with their applicable procedure:

- Office Ergonomic Evaluation, per CPCC-PRO-SH-40463, *Ergonomics*
- *Hanford Confined Space Hazard Identification* (Site Form A-6005-724), per DOE-0360 *Hanford Site Confined Space Procedure (HSCSP)*
- Beryllium Hazard Assessment per DOE-0342-001, *Hanford Site Beryllium Work Permit (BWP) and Hazard Assessment Procedure*
- *Heat Stress Evaluation* (Site Form A-6007-263), per CPCC-PRO-SH-121, *Heat Stress Control*

The IHEA is documented on an *Industrial Hygiene Exposure Assessment (IHEA)* (Site Form A-6007-296) and the process may involve development and use of multiple supporting documents, including:

- *Industrial Hygiene Hazard Screening Form* (Site Form A-6007-295)
- *Industrial Hygiene Exposure Risk Worksheet* (Site Form A-6007-448)

- *Industrial Hygiene Sample Plan* (Site Form A-6007-395)
- *Industrial Hygiene Technical Evaluation* (Site Form A-6006-552)
- *Industrial Hygiene Work Permit* (Site Form A-6007-313)

3.1 Industrial Hygiene Screening Processes (Optional)

When reviewing work activities, the IH Hazard Screening Form is a tool available to help the Industrial Hygienist determine if an IHEA or other hazard evaluation document is required. This can also be used to document and communicate to the Work Planner or Responsible Manager that an evaluation of the work scope has been performed (when there are no hazards of occupational significance).

3.1.1 Industrial Hygiene Screening for Activities

NOTE: *If the work planner chooses to, the Industrial Hygiene Hazard Screening Form (Site Form A 6007-295) may be retained in the work package and managed in accordance with CPCC-PRO-WKM-12115, Work Management. Otherwise it is not considered a record.*

Actionee	*Step*	*Action*
IH Professional	1.	COMPLETE the *Industrial Hygiene Hazard Screening Form* (Site Form A-6007-295) to determine if an IHEA, or other hazard evaluation, is required.
	2.	COMMUNICATE hazard screening results to the Responsible Manager (RM) and/or Work Planner, AND PROVIDE the applicable required documentation indicated on the IH Hazard Screening Form. The planner may want the completed form to document that a review of the work scope was performed and it was determined there were no hazards of occupational significance.

3.2 Industrial Hygiene Exposure Assessment (IHEA)

Actionee	*Step*	*Action*
IH Professional	1.	OBTAIN an IHEA number from the SWIHD Administrator.
	2.	Using Site Form A-6007-296, PREPARE an Industrial Hygiene Exposure Assessment.
		a. IDENTIFY the IHEA Review Cycle based on exposure potential: • 1 year review – agents at or above an Action Level (50% OEL) or having the potential for serious health effects • 2 year review – agents at or above an Administrative Control Level but below an Action Level (50% OEL) • 3 year review – agents below the Administrative Control Level • N/A – for IHEAs that are generated for a single, non-recurrent activity
		b. PROVIDE a detailed description of the evaluated activity, including: • Location (Area, Facility, Building, Indoor/Outdoor). • List of work documents and/or procedures describing the evaluated scope of work. If a work package or procedure has embedded procedures that are part of the evaluated scope, they should be listed as well. • List any hazard evaluation documents covering hazards of significance that are part of the evaluated scope of work, unless the hazard is reanalyzed in the IHEA. • Tools, equipment, products, control systems and work practices/processes that will be used. • Facility systems/equipment to be worked on including legacy chemicals or other potential hazards. • Conditions that could affect exposure (such as air flow, temperature controlled building, proximity to walls or other objects/equipment, etc.).

Actionee	*Step*	*Action*

NOTE: *To assist in exposure evaluation, the IHEA author may utilize tools such as the Industrial Hygiene Exposure Risk Worksheet (Site Form A-6007-448) or others of their choosing. When using evaluation tools, summarize in the IHEA and attach copies.*

IH Professional

c. DEFINE the hazard(s) and worker(s) with potential exposure to them. Group workers with similar exposures (Similar Exposure Group [SEG]) but do not include workers with a different exposure level to the same hazard.

1) To document that all hazards identified during the planning process were evaluated, LIST hazards not of occupational significance and a brief description as to why they are not.

NOTE: *Parameters for potential consideration when evaluating hazards:*

- *Chemical –*
  - *CAS Number*
  - *Vapor Pressure*
  - *Percent (%) of agent in product/material*
  - *Flash Point*
  - *Boiling Point*
  - *Lower Explosive Limit*
  - *Specific Gravity*
  - *pH*
  - *State of Matter*
  - *the most stringent OEL*
  - *Route of Entry*
  - *Odor Threshold*
  - *Special Notation(s) from the American Conference of Governmental Industrial Hygienists (ACGIH®)*
  - *Notable Globally Harmonized System (GHS) statements*
- *Physical –*
  - *Sources*
  - *type of noise/energy*
  - *intensity of energy*
  - *noise and solvent exposure together*
  - *the most stringent OEL*
- *Biological –*
  - *Size of affected area*
  - *Type of biologic agent*
  - *Agent dispersion*
  - *Centers for Disease Control recommendations*

Actionee	*Step*	*Action*

- *Ergonomic –*
  - *Repetitive motion*
  - *Range of motion*
  - *Use of force*
  - *Affected body area*
  - *Distance between user and work*
  - *ACGIH TLVs*

IH Professional

d. EVALUATE potential exposure for each SEG.

1) DEVELOP a rationale as to whether or not the hazardous agent(s) pose an exposure hazard to the worker(s) based on:

- Exposure frequency and duration
- Quantity and/or concentration (e.g., chemical/biological) and/or intensity (e.g., physical/ergonomic) of the hazardous agent(s)
- Health effects from exposure to the hazardous agent(s)
- Exposure potential based on the hazardous agent(s) and route of entry
- Conditions that could increase the exposure potential
- Exposure potential based on environmental conditions and engineering controls
- Parts of the body that could contact corrosives, irritants, or sensitizers

2) REVIEW previous monitoring and sampling results. This can include studies performed by equipment or product manufacturer studies. List or Attach results utilized to evaluate exposure potential.

NOTE:

- *For guidance, refer to any hazard specific procedures or regulations, Appendix C, "Recommended Controls for Carcinogens and Teratogens," and/or Appendix D, "Recommended Controls for Biological Agents."*
- *Exposure controls are applied to reduce the potential for exposure, and are required when exposures are anticipated to reach or exceed 50% of an OEL, or, when there is a clearly recognized potential hazard requiring controls, such as potential exposure to Hantavirus.*

e. IDENTIFY control set to mitigate potential exposure hazards using the hierarchy of controls. The control set must be fully described in the "Controls" section of the IHEA, as this will be reviewed by Responsible Managers, Work Planners, Field Work Supervisors, and Assessors to determine if controls are being implemented.

Actionee	*Step*	*Action*
IH Professional		LIST required training by course number, the SEG(s) it applies to and during which activities it is required.
	1)	LIST required medical monitoring by "Program Name" found in EJTA. Include which SEG(s) must have it and during which activities it is required.
	2)	DESCRIBE Engineering Controls – Include details that could affect the control, such as make and model of equipment or performance criteria (such as ≥250 CFM), verification testing of equipment, any attachments and expected set-up/use instructions.
	3)	
	4)	DESCRIBE Administrative Controls – Include details such as: Where boundaries are to be set-up, any monitoring using direct reading equipment, allowable boundary levels and expected actions if levels are exceeded; Step Back Levels and actions to be taken if exceeded; Exact wording on postings or waste hazard warning labels (e.g., for Lead, Asbestos, Cadmium) and type of ANSI sign (e.g., Danger, Warning, Caution, Notice); Worker rotation; etc.
	5)	DESCRIBE PPE Set – For each SEG, describe required PPE and when to wear. • Include respiratory protection type (1/2 face APR, FF-APR, FF-PAPR, Hood-PAPR, Supplied Air w/esc, SCBA) and cartridge (attach end of service life calculation printout). • For hearing protection, specify Noise Reduction Rating (NRR) and if a specific type is required. • For chemical protective clothing, including gloves, specify manufacturer and model (attach chemical resistance data for model selected). When the only protective property needed is impermeable, state that and any other pertinent information such as the length of cuff, thickness of material, etc.

Actionee	*Step*	*Action*

NOTE:
- Agents and analytical methods identified in SWIHD dropdown menus reflect the agents/analytical methods regularly used and currently approved under *CPCCo* laboratory analysis contracts.
  - *Contact the SWIHD Administrator if the agent or analytical method is not identified in SWIHD dropdown menus.*
- *The basis (contaminants/hazards of occupational significance) for Monitoring and Sampling as well as what is needed (such as the number of samples) to support the evaluation are to be documented in the IHEA. Monitoring and Sampling details have to be in either the IHSP or IHWP but can also placed in the IHEA for information.*

IH Professional

f. IDENTIFY required monitoring and sampling for agents having an exposure potential of occupational significance.

1) IDENTIFY chemical agents to be sampled by the Name and/or Chemical Abstract Society (CAS) number, and identify the analytical method/number.

2) IDENTIFY decisions that will be made based on sample results, e.g., if results exceed an OEL.

3) COMPLETE an *Industrial Hygiene Sample Plan* (Site Form A-6007-395) or an *Industrial Hygiene Work Permit* (Site Form A-6007-313) to communicate monitoring and sampling information to the IH Surveyor. Level of detail depends on the personnel that will perform.

3. FORWARD the IHEA to a Qualified IH to peer review the evaluation and concur.

NOTE: *The Qualified IH is the approver of the document and is responsible for verifying:*

- *All hazards have been addressed.*
- *All requirements (procedural and regulatory) have been included.*
- *All calculations are correct.*

Qualified IH

4. REVIEW the IHEA,
   PROVIDE an approval signature after the review is complete,
   AND RETURN to the IH Professional.

   a. IF the IHEA cannot be approved as is,
      THEN WORK with the IH Professional who prepared the IHEA to resolve the concern.

Actionee	*Step*	*Action*
IH Professional	5.	COMMUNICATE hazard controls to line management/planners using any of the following means: • *Industrial Hygiene Work Permit* (Site Form A-6007-313) (see Section 3.5), OR • Language embedding the controls and requirements in the work package instruction, OR • *Job Hazard Analysis Checklist* (Site Form A-6006-681), or *Job Hazard Analysis/Activity Hazard Analysis for Subcontractors* (Site Form A-6004-784), in accordance with CPCC-PRO-WKM-079, *Job Hazard Analysis*.
	6.	PROVIDE a clean signed electronic copy to the SWIHD Administrator.
SWIHD Administrator	7.	SUBMIT IHEA to Records Retention Center for retention and disposition.
IH Surveyor	8.	As applicable, COLLECT AND RECORD exposure data in accordance with CPCC-PRO-SH-409, *Industrial Hygiene Monitoring, Reporting and Records Management*.

Actionee	*Step*	*Action*

NOTE: *For IHEAs that require sampling and monitoring, an integral part of the process is reviewing collected data to verify exposures do not exceed what was anticipated, that exposure groups are identified correctly, and/or to determine when sampling may be curtailed. Using descriptive statistics, a dataset may be evaluated to validate an SEG designation, or used to predict potential health outcomes (Refer to Appendix B, "Statistical Evaluation of Exposure Data").*

IH Professional

9. As feasible and relevant, VALIDATE exposures and controls after sufficient sample data is obtained, e.g., generally 6 to 12 samples (for additional information refer to Appendix B, "Statistical Evaluation of Exposure Data").

    a. DETERMINE the number of samples for each agent, the data range, the average and maximum values,
    AND COMPARE to the OEL to determine if controls are adequate.

    b. As needed, PERFORM statistical analysis of exposure data to determine if the exposure group meets the definition of an SEG, in accordance with Appendix B,
    AND DOCUMENT results in the IHEA.

        1) ATTACH the statistical evaluation to the IHEA.

    c. REVISE IHEA information to show validation of an SEG and exposure controls,
    OR REVISE the definition of the exposure group and control set if sample statistics do not validate the SEG.

10. IDENTIFY conclusions, such as if exposures were judged acceptable or unacceptable, or if more data are needed to resolve the assessment,
AND REVISE the IHEA.

    - A diagnostic exposure assessment report should provide observations and conclusion about the sources of exposure and the effectiveness of controls.
    - A compliance exposure assessment should include an evaluation of personal sample times to verify the sample may be directly compared to an OEL, and should identify if representative sampling is performed, if required.
    - Interpretive remarks should be provided. Identify and reference all assumptions and models, if applicable.

11. After the exposure is judged, REVIEW the Employee Job Task Analysis (EJTA) of individuals in an exposure group
AND DETERMINE if updates are needed, in accordance with CPCC-PRO-SH-52755, *Employee Job Task Analysis*.

Actionee	*Step*	*Action*
IH Professional	12.	WHEN changes and/or a periodic review of the IHEA is required THEN REVISE the IHEA AND OBTAIN Peer Approval (signature).
	13.	PROVIDE a clean signed electronic copy to the SWIHD Administrator.
SWIHD Administrator	14.	SUBMIT IHEA to Records Retention Center for retention and disposition.

3.3 Industrial Hygiene Sample Plan (IHSP)

Sampling instructions must be placed into either the *Industrial Hygiene Sample Plan* (Site Form A-6007-395) or the *Industrial Hygiene Work Permit* (Site Form A-6007-313) (see Section 3.5). These are required prior to collection of samples, identify technical sampling and analytical information and help identify decision outcomes based on sampling results.

Actionee	*Step*	*Action*
IH Professional	1.	OBTAIN an IHSP number from the SWIHD Administrator AND NOTE the IHSP number on the *Industrial Hygiene Exposure Assessment (IHEA)* (Site Form A-6007-296).
	2.	IDENTIFY required sampling, monitoring, and analytical information using *Industrial Hygiene Sample Plan*.
	3.	ESTABLISH a priority/schedule for sampling and monitoring activities.
	4.	IDENTIFY decisions and/or follow-up actions based on sample results, such as: • If sample results exceed an OEL • Release of an area if area sample results are below an applicable Clearance Level • Cessation of monitoring if personal sample results are below an applicable ACL

Actionee	*Step*	*Action*

NOTE: *Most OSHA or National Institute of Occupational Safety and Health (NIOSH) sampling methods are written to sample chemical exposures that are above the agent Action Level or AL (e.g., 50% of the OEL). Sample volume may be adjusted by the IH when exposures are expected to be below the AL.*

5. As needed, ADJUST the minimum sample volume to obtain meaningful sample results using the following formula to adjust the minimum sample volume, when the chemical agent concentration is expected to be below the AL:

$$\textbf{Minimum Sample Volume} = \frac{\textbf{Agent Limit of Detection or Reporting Limit}}{\textbf{Agent OEL* x Anticipated Fraction of the OEL}}$$

*in units of mg/m^3

IH Professional

6. IDENTIFY reviewer(s)
AND FORWARD for review and approval signatures. The minimum required is a peer review by a Qualified Industrial Hygienist. Projects may elect to have FWSs or IHT Supervisors review and in some instances, a procedure may require a review by the Technical Authority.

NOTE: *The Qualified IH is the approver of the document and is responsible for verifying that the IHSP instructions, when followed, will ensure that sampling will be performed in accordance with applicable sampling methods and that data collected will support the IHEA's objectives.*

Qualified IH

7. PEER REVIEW the IHSP,
PROVIDE an approval signature after the review is complete,
AND RETURN to the IH Professional.

   a. IF the IHSP cannot be approved as is,
   THEN WORK with the IH Professional who prepared the IHEA to resolve the concern.

IH Professional

8. WHEN changes and/or a periodic review of the IHSP is required
THEN REVISE the IHSP
AND OBTAIN Peer Approval from a Qualified IH.

9. PROVIDE a clean signed electronic copy of the IHSP to the SWIHD Administrator.

SWIHD Administrator

10. SUBMIT IHSP to Records Retention Center for retention and disposition.

3.4 Industrial Hygiene Technical Evaluation (IHTE)

An IHTE is a document that may be used to establish a decision basis or process not otherwise specified by regulation or industry standard (sometimes referred to as a white paper of interpretative guidance document). An IHTE is not a required document and cannot be used in lieu of an IHEA. The IHEA may reference a Technical Evaluation, such as ventilation calculations performed in support of a work activity, but the IHTE is a separate stand-alone document.

The following elements are typically documented in an IHTE:

- Summary of the technical issue
- Summary of the requirements (e.g., regulatory, procedural, contractual)
- Calculations
- Decision description
- Basis for the decision (including any assumptions)
- Bounding conditions of the decisions

Actionee	*Step*	*Action*
IH Professional	1.	OBTAIN an IHTE number from the SWIHD Administrator.
	2.	PREPARE the IHTE using *Industrial Hygiene Technical Evaluation* (Site Form A-6006-552) AND ATTACH calculations and supporting data.
	3.	IDENTIFY peer reviewer (Qualified IH), the TA, and the IH Programs Manager as reviewers AND FORWARD for review and approval signatures.
Qualified IH, TA, IH Programs Manager	4.	REVIEW the IHTE, PROVIDE an approval signature after the review is complete, AND RETURN to the IH Professional. a. IF the IHTE cannot be approved as is, THEN WORK with the IH Professional who prepared the IHTE to resolve the concern.
IH Professional	5.	WHEN changes and/or a periodic review of the IHTE is required THEN REVISE the IHTE AND OBTAIN Peer Approval (from a Qualified IH), TA, and IH Programs Manager.
	6.	PROVIDE a clean signed electronic copy of the IHTE to the SWIHD Administrator.
SWIHD Administrator	7.	SUBMIT IHTE to Records Retention Center for retention and disposition.

3.5 Industrial Hygiene Work Permit (IHWP)

The IHWP can be used for creating a Cadmium, Lead or Silica Compliance Plan when the applicable compliance section and the other parts of the permit are completed. It can also may be used in the field to direct sampling (in lieu of the IHSP) and control sets identified in the IHEA. For example, the IHWP may be used:

- In a space that contains hazards that affect all or most work performed within it. It allows space entrants to follow the hazard control set and sampling requirements on a permit instead of embedding those instructions into every work package or procedure that directs work within that space. When used, each of the work packages or procedures can direct personnel to follow the permit when working in the space.
- For repetitive activities where a long list of chemicals may be potentially used, such as for maintenance activities/procedures (e.g., specific PPE and controls for long chemical lists are identified by chemical name so the user can easily determine PPE/controls for the chemical they are using). When used, work packages, preventative maintenance instructions or procedures can direct personnel to follow the permit when using the evaluated chemicals.
- As a Compliance Plan for Cadmium, Lead, and Silica work. By completing the applicable compliance plan section and all other sections of the permit, this document when paired with the IHEA meets the regulatory requirements.

If an IHWP is used, an *Industrial Hygiene Work Permit Acknowledgement/Review Record* (Site Form A-6007-634) must be used to document employee review of the IHWP. The acknowledgement form is retained in project documents (e.g., work package or procedure) and managed in accordance with CPCC-PRO-WKM-12115.

Sampling instructions must be placed into either the *Industrial Hygiene Work Permit* (Site Form A-6007-313) or the *Industrial Hygiene Sample Plan* (Site Form A-6007-395) (see Section 3.3). These are required prior to collection of samples, identify technical sampling and analytical information and help identify decision outcomes based on sampling results.

Actionee	*Step*	*Action*
IH Professional	1.	OBTAIN an IHWP number from the SWIHD Administrator AND NOTE the IHSP number on the *Industrial Hygiene Exposure Assessment (IHEA)* (Site Form A-6007-296).
	2.	IDENTIFY required sampling, monitoring, and analytical information using *Industrial Hygiene Work Permit*.
	3.	ESTABLISH a priority/schedule for sampling and monitoring activities.

Actionee	*Step*	*Action*
IH Professional	4.	IDENTIFY decisions and/or follow-up actions based on sample results, such as: • If sample results exceed an OEL • Release of an area if area sample results are below an applicable Clearance Level • Cessation of monitoring if personal sample results are below an applicable ACL

NOTE: *Most OSHA or National Institute of Occupational Safety and Health (NIOSH) sampling methods are written to sample chemical exposures that are above the agent Action Level or AL (e.g., 50% of the OEL). Sample volume may be adjusted by the IH when exposures are expected to be below the AL.*

5. As needed, ADJUST the minimum sample volume to obtain meaningful sample results using the following formula to adjust the minimum sample volume, when the chemical agent concentration is expected to be below the AL:

$$\textbf{Minimum Sample Volume} = \frac{\textbf{Agent Limit of Detection or Reporting Limit}}{\textbf{Agent OEL* x Anticipated Fraction of the OEL}}$$

*in units of mg/m^3

6. ADD control sets from the IHEA that will not be included in the procedure/work instructions.

7. IDENTIFY reviewer(s)
AND FORWARD for review and approval signatures. The minimum required is a peer review by a Qualified Industrial Hygienist. Projects may elect to have FWSs or IHT Supervisors review and in some instances, a procedure may require a review by the Technical Authority.

Actionee	*Step*	*Action*

NOTE: *The Qualified IH is the approver of the document and is responsible for verifying that:*

- *The IHWP instructions, when followed, will ensure that sampling will be performed in accordance with applicable sampling methods and that data collected will support the IHEA's objectives.*
- *The IHWP communicates the control set developed in the IHEA.*
- *The IHWP when paired with the IHEA contains all of the required parts of a Compliance Plan, when used for this purpose.*

Qualified IH

9. PEER REVIEW the IHWP,
   PROVIDE an approval signature after the review is complete,
   AND RETURN to the IH Professional.

   a. IF the IHWP cannot be approved as is,
      THEN WORK with the IH Professional who prepared the IHWP to resolve the concern.

10. WHEN changes and/or a periodic review of the IHWP is required
    THEN REVISE the IHWP
    AND OBTAIN Peer Approval.

IH Professional

11. PROVIDE a clean signed electronic copy of the IHWP to the SWIHD Administrator.

12. PROVIDE a copy to the Work Planner for inclusion in the work package, in accordance with CPCC-PRO-WKM-079.

13. PROVIDE a briefing on the IH Work Permit requirements to management, IH Technicians, and project workers, as needed.

    a. *Industrial Hygiene Work Permit Acknowledgement/Review Record* (Site Form A-6007-634) is available for projects to track briefings. Since the IHWP and other permits would be covered when completing the pre-job briefing checklist, it is not necessary to have a separate form. These documents should be managed in accordance with CPCC-PRO-WKM-12115.

SWIHD Administrator

14. SUBMIT IHWP to Records Retention Center for retention and disposition.

4.0 FORMS

A-6006-552, *Industrial Hygiene Technical Evaluation*
A-6007-295, *Industrial Hygiene Hazard Screening Form* (optional form)
A-6007-296, *Industrial Hygiene Exposure Assessment (IHEA)*
A-6007-313, *Industrial Hygiene Work Permit*
A-6007-395, *Industrial Hygiene Sample Plan*
A-6007-448, *Industrial Hygiene Exposure Risk Worksheet* (optional form)
A-6007-634, *Industrial Hygiene Work Permit Acknowledgement/Review Record*

5.0 RECORD IDENTIFICATION

All records are generated, processed, and maintained in accordance with CPCC-PRO-IRM-10588, *Records Management Processes*.

Records Capture Table

Name of Document	Submittal Responsibility	Retention Responsibility
Industrial Hygiene Exposure Assessment (IHEA) Packages (may contain but not limited to the following: *Industrial Hygiene Exposure Assessments* (A-6007-296 or equivalent), *Industrial Hygiene Sample Plan* (A-6007-395 or A-6005-784), *Heat Stress Evaluations* (A-6007-263), *Office Ergonomic Evaluation* (A-6006-185) and Negative Exposure Assessments)	SWIHD Administrator	IRM Service Provider
Industrial Hygiene Sample Plan, A-6007-395	SWIHD Administrator	IRM Service Provider
Industrial Hygiene Technical Evaluation, A-6006-552	SWIHD Administrator	IRM Service Provider
Industrial Hygiene Work Permit, A-6007-313	SWIHD Administrator	IRM Service Provider

6.0 SOURCES

6.1 Requirements

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910, *Occupational Safety and Health Standards*

29 CFR 1926, *Safety and Health Regulations for Construction*

ACGIH, *Threshold Limit Values for Chemical Substances, Physical Agents and Biological Exposure Indices,* 2016

CPCC-MP-SH-32219, *10 CFR 851 CPCCo Worker Safety and Health Program Description*

DOE-0342, *Hanford Site Chronic Beryllium Disease Prevention Program (CBDPP)*

6.2 References

10 CFR 830, *Nuclear Safety Management*

CPCC-PRO-IRM-10588, *Records Management Processes*

CPCC-PRO-RP-325, *Contaminated Wildlife or Vegetation*

CPCC-PRO-SH-121, *Heat Stress Control*

CPCC-PRO-SH-409, *Industrial Hygiene Monitoring, Reporting and Records Management*

CPCC-PRO-SH-40143, *Bloodborne Pathogens*

CPCC-PRO-SH-40463, *Ergonomics*

CPCC-STD-SH-40518, *Personal Protection*

CPCC-PRO-SH-52755, *Employee Job Task Analysis*

CPCC-PRO-WKM-079, *Job Hazard Analysis*

CPCC-PRO-WKM-12115, *Work Management*

CPCC-STD-TQ-54470, *Industrial Hygiene Training Program Description*

DOE-0342-001, *Hanford Site Beryllium Work Permit (BWP) and Hazard Assessment Procedure*

DOE-0352, *Hanford Site Respiratory Protection Program (HSRPP)*

DOE-0360, *Hanford Site Confined Space Procedure (HSCSP)*

6.3 Bases

CPCC-MP-SH-54469, *Industrial Hygiene Program Management Plan*

CPCC-PRO-SH-40498, *Toxic Metals Exposure Control*

CPCC-PRO-SH-40516, *Chemical Management Program*

6.4 Developmental References

American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices, 2019, ACGIH Worldwide Signature Publications, Cincinnati, OH

Industrial Ventilation, A Manual of Recommended Practice, 26th edition, 2007, ACGIH Worldwide Signature Publications, Cincinnati, OH

Manual of Analytical Methods, 2015, Centers for Disease Control and Prevention-National Institute of Occupational Safety and Health, 5th edition

OSHA Technical Manual, Section II, Personal Sampling for Air Contaminants, 2014, U.S. Department of Labor, Occupational Safety & Health Administration, Washington DC

Armstrong, TW and BD Silverstein, editors, 2000, *User's Guide to "A Strategy for Assessing and Managing Occupational Exposures*. (Second Edition)." American Industrial Hygiene Association (AIHA) Press, Fairfax, VA.

Di Nardi, SR., editor, 2003. *The Occupational Environmental: Its Evaluation, Control, and Management*. 2nd Edition. AIHA Press, Fairfax, VA

Mulhausen, JR and J Damiano. 1998. *A Strategy for Assessing and Managing Occupational Exposures*, 2nd Edition. American Industrial Hygiene Association Press, Fairfax, VA

Jahn, S.D., WH Bullock and JS Ignacio, editors, 2015. *A Strategy for Assessing and Managing Occupational Exposures*, 4th Edition. American Industrial Hygiene Association Press, Fairfax, VA

Appendix A - Glossary

Term	*Definition*
Administrative Control Level (ACL)	The hazard level below which additional assessment may not be necessary. In general, CPCCo uses 10% of the OEL as the ACL.
Action Level (AL)	A percentage, usually 50%, of the PEL assigned to agents with vertical OSHA standards; or more generally, 50% of an OEL. The AL exposure triggers compliance actions to conduct exposure monitoring, limit employee exposure, and initiates medical surveillance and training requirements.
Exposure	Subjection of an individual to a biological, chemical, ergonomic or physical hazard; the amount of an agent that has reached the individual (external dose) or has been absorbed into the individual (internal dose).
Exposure Assessment	The process of estimating or measuring the magnitude, frequency and duration of exposure to a hazardous agent. Ideally, it describes the sources, pathways, routes, and the uncertainties in measurement and assessment.
Occupational Exposure Limit (OEL)	A health-based upper limit on the acceptable concentration of a hazardous agent. At CPCCo, OELs are the lower value of either the OSHA PEL or the ACGIH TLV®.
OEL-TWA **OEL-STEL** **OEL-EL** **OEL-C**	OELs are typically expressed as: • OEL-TWA as an 8-hour *Time-Weighted Average* exposure limit (could also be expressed as a 10- or 12-hour TWAs) • OEL-STEL as a15-minute *Short-Term Exposure Limit* • OEL-EL as a 30-minute *Excursion Limit* for asbestos • OEL-C as an instantaneous *Ceiling* exposure limit
Permissible Exposure Limit (PEL)	A legal limit for exposure of an employee to a chemical/physical agent, established by OSHA. A PEL is generally given as an 8-hour TWA (and/or 15-minute STEL for chemicals) that cannot be exceeded unless mitigations, such as respiratory or hearing protection, are used to reduce the exposure to a level below the PEL and/or STEL.
Professional Judgment	The process of forming an opinion or evaluation by the application and appropriate use of specialized knowledge gained from extensive academic preparation through formal education, observation, experimentation, inference and analogy, which is also characterized by conformance with technical and ethical standards within a discipline.
Qualified Industrial Hygienist	As defined in CPCC-STD-TQ-54470, *Industrial Hygiene Training Program Description*.

Term	*Definition*
Recommended Exposure Limit (REL)	NIOSH establishes Recommended Exposure Limits (REL) in criteria documents and recommends to OSHA the adoption of RELs as PELs, to reduce or eliminate adverse health effects.
Step Back Level, or Turnback Value	A Step Back Level or Turnback Value may be established for airborne contaminants that are detected with a Direct Reading Instrument. The Step Back Level, if applicable, is usually identified on the IH Sampling Plan or IHWP, and is the point where workers are to back out of the work area. Documentation of the reasoning for the Step Back Values must be documented in the IHEA.
SDS	Safety Data Sheet (and/or the predecessor *Material Safety Data Sheet*) contain standardized information from the manufacturer listing the chemical components, their amounts, health hazards, required PPE, spill protection requirements, and contact information.
Similar Exposure Group (SEG)	A group of workers having the same general exposure profile for the agent(s) being evaluated because of the similarity and frequency of the tasks they perform; the materials and processes with which they work; and the similarity of the way they perform the tasks. An SEG can be task-based, process-based or craft-based. A task-based SEG may include an unrelated group of workers who perform a similar defined task; a craft-based SEG may include a craft group performing a variety of tasks throughout the work day or week.
Threshold Limit Value (TLV®)	Threshold limit values (TLV®) refer to concentrations of chemical substances or physical agents and represent conditions under which it is believed that *nearly all* healthy adult workers may be repeatedly exposed, day after day, over a working lifetime (e.g., 40 years), without adverse health effects. TLVs are developed to protect workers who are normal, healthy adults. TLVs for chemical agents are expressed as: TLV-TWA, TLV-STEL, or TLV-C. For ergonomic and physical agents, TLVs are generally identified for a range or set of conditions.
Time-Weighted Average (TWA)	The average measured exposure during a given work day or shift, generally expressed as an 8-hour TWA (within a 40-hour work week). The TWA may be adjusted to account for shorter or longer time periods within a 40-hour week.
Technical Evaluation (TE)	An evaluation or calculation used to establish a decision basis not otherwise specified by regulation or industry standard. An IH Technical Evaluation is documented by the process established in this procedure using Site Form A-6006-552, *Industrial Hygiene Technical Evaluation*.

Appendix B - Statistical Evaluation of Exposure Data

After a "sufficient" number of *representative* samples have been collected for compliance assessment, or for agents with an AL or OEL Exceedance, statistical evaluation may be performed to determine the:

- Type of distribution (normal versus lognormal)
- Measure of central tendency (geometric or arithmetic mean)
- Upper Confidence Limit (UCL) as a value, and as a percent (%) of the OEL
- Homogeneity of the exposures

NOTES:

1. *Following the AIHA Exposure Assessment Strategy, a "sufficient" number of samples for an SEG having little variability is six (6). If results are more variable, up to twelve (12) samples may be collected.*
2. *If the SEG cannot be defined with twelve (12) samples, consider re-defining the SEG.*
3. *When calculating any statistical metric it is critical to include all data, including those values reported as less than Limit of Detection (LOD) or Reporting Limit (RL), which are reported in summary statistics as the numeric value of the LOD/RL.*
4. *Metrics such as the 95th percentile or the exceedance fraction or Upper Tolerance Limit (UTL) may also be useful in describing the potential to exceed the exposure limit for the exposure profile.*
5. *When evaluating noise exposure data, use the Dose % to calculate summary statistics, rather than the dBA results.*

An exposure profile is a "snapshot" of the exposures experienced by members of an SEG. The use of statistical tools to characterize the exposure profile provides the IH with a technically sound basis for determining the acceptability of an SEG or exposure profile. While SEG exposures show some variability, an SEG should reflect a fairly stationary exposure condition.

Critical SEGs are those having exposure profiles near, but below, the OEL. When critical SEGs are present, the IH should carefully review the number of samples required to demonstrate with 95% confidence that the true 95th percentile exposure result is less than the OEL.

Analysis of variance (ANOVA) is another statistical technique that may be used to determine if an SEG has been appropriately defined. For additional information, review the chapters on Sampling Strategy Design and Quantitative Exposure Data, and, Appendix V in the 4th edition of AIHA's *A Strategy for Assessing and Managing Occupational Exposures.*

E-Tools such as IHSTAT, a Microsoft® Excel e-tool from the AIHA, approved for use at CPCCo, may be used to assist in the determination of the most appropriate data distribution (normal or log-normal) and in the calculation of summary statistics (e.g., mean, standard deviation, UCL, UTL).

To conduct statistical review and validation of an SEG perform the following:

1. Calculate the mean, standard deviation, UCL, and UTL

- Calculate the UCL for the dataset as a percent of the OEL (% OEL-UCL) and determine if all data points fall below the upper confidence limit.
- Calculate the 95% UTL and determine if it is below the OEL. If the UTL exceeds the OEL, then determine the exceedance fraction for the dataset.
- IF a data point falls beyond the 95% OEL-UCL, and/or if the geometric standard deviation is greater than 3,
  THEN re-evaluate the SEG and consider subdivision into 2 or more SEGs.

2. Evaluate the homogeneity of the exposures

- Arithmetic mean exposures are the average of a data set (e.g., of individual surveys), calculated by adding all sample results, and dividing by the number of samples in the data set.
- To be a considered an SEG, the arithmetic mean of exposures from different surveys should not differ by more than a factor of 2, for 95% of the workers evaluated.

3. Verify the SEG

- If data points are all below the 95% OEL-UCL, AND, the data set meets a criterion for homogeneity, then the SEG may be considered as validated. Ideally, the 95% UTL will also be below the OEL.

Appendix C - Recommended Controls for Carcinogens and Teratogens

Carcinogens and teratogens generally require special consideration when assessing exposure hazards, because:

- Compliance sampling may be required;
- Some agents pose reproductive hazards;
- Some agents lack a recognized “safe” exposure level.

At CPCCo, the following chemical groups are defined as “carcinogens” and require an IHEA if present above threshold quantities:

- International Agency for Research on Cancer (IARC):
  - Group 1 (Carcinogenic to Humans)
  - Group 2A (Probably Carcinogenic to Humans)
  - Group 2B (Possibly Carcinogenic to Humans)

- American Conference of Governmental Industrial Hygienists (ACGIH®):
  - A1 (Confirmed Human Carcinogen)
  - A2 (Suspected Human Carcinogen)

- National Toxicology Program (NTP):
  - Group 1 (Known to be Human Carcinogens)
  - Group 2 (Reasonably Anticipated to be Human Carcinogens)

- OSHA-Specific Carcinogens that have a Vertical OSHA Standard (see Table C-1):
- OSHA-Regulated Carcinogen listed under 29 CFR 1910.1003 or 29 CFR 1926.1103 (see Table 2 “OSHA-Regulated Carcinogens”)

General requirements for managing carcinogens include considerations such as threshold quantities, state of matter, monitoring, reporting of monitoring results, exposure limits, medical surveillance, warning signs/labels, hygiene facilities/practices, use of PPE and training.

THRESHOLD QUANTITY EXEMPTIONS: Regulatory threshold quantities are the stipulated minimal prerequisite concentrations that must be present in a chemical product or waste mixture. Threshold quantities vary for OSHA-regulated carcinogens.

The following chemicals are exempt by OSHA for those mixtures of a solid or liquid with carcinogenic constituents less than or equal to **1.0 percent (%)**:

α-Naphthalene	3,3′-Dichlorobenzidine (and its salts)
Ethyleneimine	β -Propiolactone
2-Acetylaminofluorene	4-Dimethylaminoazobenzene
N-Nitrosodimethylamine	Asbestos

For chemical carcinogens not otherwise specified, the threshold quantity is **0.1%** or less by weight or volume. A limited number of chemical carcinogens regulated by OSHA standards have NO exempted threshold quantity.

Table C-1. OSHA-Specific Carcinogens with Vertical Standards

Compound	CAS Number(s)	OSHA Reference
1, 2-Dibromo-3-chloropropane	96-12-8	29 CFR 1910.1044
1, 3-Butadiene Appendix C - (Cont.)	106-99-0	29 CFR 1910.1051
4,4'-Methylenedianaline	101-77-9	29 CFR 1910.1050
Acrylonitile	107-13-1	29 CFR 1910.1045
Asbestos	Varies by mineral	29 CFR 1910.1001
Benzene	71-43-2	29 CFR 1910.1028
Cadmium	Varies by compound	29 CFR 1910.1027
Chromium (VI) (Hexavalent)	Varies by compound	29 CFR 1910.1026
Ethylene oxide	75-21-8	29 CFR 1910.1047
Formaldehyde	50-00-1	29 CFR 1910.1048
Inorganic arsenic	Varies by compound	29 CFR 1910.1018
Methylene chloride	75-09-2	29 CFR 1910.1052
Vinyl chloride	75-01-4	29 CFR 1910.1017

Table C-2. OSHA-Regulated Carcinogens

Compound	CAS Number	OSHA Reference
4-Nitrobiphenyl	92-93-3	29 CFR 1910.1003
α-Naphthalene	134-32-7	29 CFR 1910.1004
Methyl chloromethyl ether	107-30-2	29 CFR 1910.1006
3,3'-Dichlorobenzidine, salts	91-94-1	29 CFR 1910.1007
Bis-Chloromethyl ether	542-88-1	29 CFR 1910.1008
β-Naphthalene	91-59-8	29 CFR 1910.1009
Benzidine	92-87-5	29 CFR 1910.1010
4-Aminodiphenyl	92-67-1	29 CFR 1910.1011
Ethyleneimine	151-56-4	29 CFR 1910.1012
β-Propiolactone	57-57-8	29 CFR 1910.1013
2-Acetylaminofluorene	53-96-3	29 CFR 1910.1014
4-Dimethyleaminobenzene	60-11-7	29 CFR 1910.1015
N-Nitrosodimethylamine	62-75-9	29 CFR 1910.1016

IHEA Considerations for Carcinogens and Teratogens

1. Where feasible, IDENTIFY substitute products/materials to minimize exposure to carcinogens and/or teratogens in accordance with CPCC-PRO-SH-40516, *Chemical Management Program*.

2. DEVELOP exposure controls for CPCCo-defined “carcinogens” above threshold quantities that have the potential to:

    - Become airborne,
    - Cause skin/eye irritation,
    - Enter the body through the skin/eye.

3. CONDUCT baseline exposure assessment for all activities where the potential for carcinogen or teratogen exposure has been evaluated as greater than 10% of the OEL.

    - MANAGE all work activities involving carcinogens above threshold quantities as if they exceed the OSHA PEL until exposure assessment activities have been completed, i.e., until statistical analysis has validated the IHEA.

4. RECOMMEND the establishment of regulated areas where carcinogens identified in Tables C-1 and C-2 are processed, used, repackaged, released, or handled, where exposure is reasonably anticipated to exceed the OSHA PEL or STEL.

    - IDENTIFY prohibitions in the regulated area, such as prohibitions on storage and consumption of food, beverage, medicines, tobacco products, chewing gum, and the application of cosmetics or handling of contact lenses.

5. RECOMMEND use of personal protective equipment (PPE) where carcinogens and/or teratogens are processed, used, repackaged, released or handled.

    - IDENTIFY PPE and/or respiratory protection in accordance with CPCC-STD-SH-40518, *Personal Protection*, and DOE-0352, *Hanford Site Respiratory Protection Program (HSRPP)*, to include chemical protective clothing and respiratory protection.

6. IDENTIFY specialized training and medical surveillance on employee EJTAs for those who may be exposed to a carcinogen at or above a regulatory action level.

Appendix D - Recommended Controls for Biological Agents

Anticipated exposure to Hazardous Biological Agents (HBA) in CPCCo operations is minimal. Human infection could result from inhalation of aerosolized dusts from infected animal excreta (urine, feces, saliva), fungal spores, or aerosolized mists from water systems containing legionella bacteria.

The key to prevention of illness from biological agents is to:

- Minimize contact with animal carcasses and wastes, molds, or water system components such as cooling towers; and/or limit time in locations where exposure could occur.

Hazards from biological agents in CPCCo Operations may include but are not limited to:

- Hantavirus Pulmonary or Cardiopulmonary Syndrome, from inhalation of aerosolized rodent (e.g., deer mice) urine, saliva and/or feces;
- Illness from inhalation of aerosolized fungal/histoplasma spores, or bacteria/protista (leptspira, coccidia, salmonella) potentially present in rodent, bird or bat urine or feces;
- Illness from or allergic response to inhalation of aerosolized mold and/or spores in facilities from water intrusion;
- Illness from inhalation of aerosolized legionella bacteria in water system cooling towers, evaporative coolers in facilities, and portable evaporative cooling equipment;
- Illness from contact with blood or materials contaminated with a vector's blood (e.g., bloodborne pathogens) (refer to CPCC-PRO-SH-40143, *Bloodborne Pathogens*).

IHEA Considerations for HBA

Use the guidance below and in Tables D-1 through D-3 to identify controls needed to safely handle HBA and/or minimize the potential for exposure.

1. TREAT all introduced biological material (e.g., rodent/bird/bat waste, mold, etc.) as potential HBA.

NOTE: Animal carcasses and infestation areas less than 1 square meter are considered minor and may be removed under this procedure. Upon discovery of a major rodent or bird infestation, report it to the Mission Support Contractor's Site Services. They should also be notified of large animal carcasses, such as coyote or deer.

2. If potential HBA exposure hazards are present, limit exposure time and access to areas of concerns and plan work to mitigate hazards using Tables D-1 through D-3.
3. CONDUCT radiological surveys on dry wildlife and excreta, prior to disturbing.
4. USE "Universal Precautions," to include PPE, to handle, clean, and/or dispose of HBA.
5. USE disinfectant solutions and identified wait times to deactivate HBA.
6. IDENTIFY the CPCCo Biological Hazards computer-based training for workers, Course #600260, prior to clean-up/disturbance, and annually thereafter.

7. REVIEW Safety Data Sheets for products used, work methods, and PPE requirements with workers, prior to clean-up/disturbance.

Table D-1. General Guidelines to Remediate Hazardous Biological Agents

Appendix D (Cont.)

1. If the affected area is an enclosed space, **ventilate** for **30 minutes** before entry.
2. If the affected area is in a posted radiological controlled area, or if survey is deemed necessary by RadCon, complete radiological surveys of the HBA before disturbing any material, in accordance with COCC-PRO-RP-325, *Contaminated Wildlife or Vegetation*.
3. After wetting of HBA with disinfectants, **allow a wait time** for deactivation or **soaking** in accordance with the manufacturer or product recommendations.
4. CONSIDER that the thicker the HBA accumulation, the more soaking time is required. If additional wetting is required, then **additional wait time** is required.
5. Remove and containerize visible HBA, debris and cleaning rags/towels, using **wet methods**.
NOTE: Do NOT dry sweep or dust. HEPA-vacuuming is generally **not recommended** for HBA cleanup, but may be appropriate for some areas, in accordance with direction from OS&IH/Rad Con.
6. After deactivation of fungi, **remove** mold on drywall, wood, or carpet, using tools to cut out the affected material with visible mold or water damage.
7. **Wrap waste** and dispose of waste in accordance with Environmental Compliance direction.
8. **Disinfect substrate surfaces** after HBAs have been removed.
9. **Spray work gloves** with disinfectant before doffing them, and dispose of as HBA waste.
10. If a respirator is used, wet-wipe the respirator to remove visible debris with respirator towelettes (e.g., HMIS respirator towelettes) before returning it to the respirator station and dispose of used towelettes and respirator cartridges with HBA waste.
11. Following HBA cleanup, **thoroughly wash hands** with disinfectant soap before eating, drinking, or smoking.

Table D-2. Personal Protective Equipment Selection Guidelines for Cleanup of Hazardous Biological Agents

Conditions of Use	Recommended Respiratory and PPE
Cleanup Indoors - Occupied Facilities: Minor rodent contamination; facility under active ventilation; JHA identifies hazards; Radiological Work Permit not required.	Nitrile, latex or surgeon's gloves
Entry/Remediation of Areas not under Active Ventilation or not Occupied on a daily basis: Minor to moderate HBA contamination; facility or area can be ventilated and/or exposed to sunlight, as feasible.	Nitrile, latex or surgeon's gloves; Disposable coveralls
Entry/Remediation of Areas not under Active Ventilation or not Occupied on a daily basis: Moderate to heavy HBA contamination; facility or area with limited ventilation and (or) other hazards.	Nitrile, latex or surgeon's gloves (2 pairs); Disposable coveralls; Air Purifying Respirator (or Powered Air Purifying Respirator) equipped with P-100 filters

Appendix D – (Cont.)

Table D-3. Disinfectant Selection
Disinfectant Classes Listed in Order of Organism Susceptibility

Type of Biohazard	Disinfectant Class	Disinfectant Base	Approved Product	Product Use	Approximate Contact Times	Can the Disinfected Waste be Disposed of as Non-Regulated Waste? (Yes/No)
1. **Fungi** (*Candida, Cryptococcus, Aspergillus, Dermatophytes*) 2. **Bird/Bat Droppings** (may contain fungal spores: *Histoplasma;* bacteria: *Salmonella, Leptospira*; viruses; and protists: *Coccidia*)	Intermediate Level Disinfectant (Bio-Safety Level-1)	3 % Hydrogen Peroxide	**Oxivir TB**	Ready to Use	**<u>10 minutes</u>** ***NOTE:*** Consult the product label for approximate contact times.	**Yes. Small amounts of disinfected wastes may be placed into regular trash**; otherwise, request container(s) for disposal. ***NOTE:*** 1.) **Animal carcasses**, **free liquids** and **large amounts** of biological waste are **prohibited** in the regular trash. 2.) **A waste determination path is necessary before disposing unused** disinfectant, ***Ready to Use* products,** and (or) **prepared disinfectant** solutions.
		Chlorine	**Bleach**	Mix 1 part bleach with 9 parts water, solution made daily (10% solution)		
3. **Blood and Bloodborne Pathogens** (hepatitis B and C viruses, HIV) 4. **Vegetative Bacteria** (*Staphylococcus, Salmonella, Pseudomonas, Leptospira*, coliforms) 5. **Enveloped Viruses** (Hantavirus, herpes, measles, mumps, rubella, influenza, respiratory synctial, HIV)	Low Level Disinfectant (Bio-Safety Level-1)	Phenolic	**Lysol**	Ready to Use		
		Quaternary Ammonium (may cause skin/respiratory irritation)	**Lemon HG**	Mix 2 oz/1 gal water, solution made daily		
			Nisus DSV			